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ABSTRACT

The role of language in conservation tasks and the development of the concept of conservation of quantity in young children are investigated in this study. A total of 50 children, aged 3.0 to 4.7 years, were divided into three groups according to age with a large number clustered around age 4.0 years. Children were randomly assigned to one of two order effects. In the first effect, called the MORE condition, the child was presented with unequal rows of M&Ms and asked "Which row is (has) more, or are they both the same?" Following the child's response, the M&M's were equalized, then rearranged into unequal rows. The child was told "Take the row you want to eat, and eat all the M&Ms in that row." In the second effect, called the EAT condition, the same two instructions were given in the reverse order. Results indicate that children's comprehension of the "more" question increases with age; however, the children demonstrated better comprehension of numerosity when told to "eat" a row than when asked which row had "more." In addition, the children clustered at age 4 appeared to be transitional in verbal concept development regarding semantic contexts (the prior instruction "eat" cued them regarding the meaning of "more"). It is suggested that the results reflect on the young child's verbal concept development regarding number. (ED)

"Conservation" Responses in Very Young Children

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Abstract

In a Piagetian number conservation task, children of 3 years, no months (3-0) to 4 years, 7 months (4-7) gradually increase as a group in comprehension of a number comparative more question. They demonstrate better comprehension of numerosity, however, when instructed to select a row to eat than when asked which row has more in it. Children in the middle of this age range (3-8 to 4-3) appear to be transitional in verbal concept development regarding the semantic contexts in which more refers to numerosity. The prior instruction eat cues these transitional children regarding the meaning of more. Thus they give more "conservation" responses to more when it follows eat than when it precedes eat in an experimental order effect. This order effect is absent among the younger (3-0 to 3-7) and older (4-4 to 4-7) age groups. The order effect analysis permitted a psycholinguistic reinterpretation of Mehler and Bever's (1967) finding of a U-shaped conservation curve, when "conservation" responses were plotted against age. While the present study replicated their U-shaped finding for the eat instruction, it discusses the finding as not supporting Mehler and Bever's (1967) interpretation that conservation occurs in the pre-operational child. Instead the finding is viewed as important in its own right as it reflects upon the young child's verbal concept development regarding number. From a Piagetian perspective, there may be an interaction between the labels which the child associates with the perceptual constancies during early development and the labels which he associates with conceptual quantity during later development. The present perspective is used to consider how the issue of the child's comprehension should influence both future investigations and the work of the early childhood practitioner community.

"Conservation" Responses in Very Young Children

Piaget (1952a, 1952b) infers the cognitive capacity of children from their verbal responses to questions regarding various displays and rearrangements of stimulus materials. In a particular form of experimental situation, the equivalence conservation task, the examiner confronts the child with two quantities of material, e.g., two masses, two volumes, two row-arrays of identical objects. In such a task, the experimenter first establishes that the child judges their apparent phenomenological equivalence; in this step, he does not assume that the child understands equivalence in any clear quantitative or conceptual sense. Even though the two quantities are in fact equal, such an initial judgment only demonstrates perceptual equivalence.

Next, to ascertain whether the child does understand in a conceptual sense, the experimenter alters the phenomenology of the two quantities by the operation of removing part of one quantity, changing the morphological appearance of one or both, or by similar operations. The child at all times has free visual access to the experimenter's operations on the materials. The altered arrangement is usually displayed so as to make probable for the preconceptual child an incorrect judgment that the quantities are now equal, or if unequal, to favor the incorrect judgment of which is more unless the child indeed conserves quantity. The child is asked, "Are they now the same?" or "Is one more?". If the child does not decide on the basis of appearance but judges quantity instead on the basis of whether or not material has been transferred or removed from one of the quantities, he is said to have "conserved quantity". That is, he responds to the quantity of material present rather than to phenomenological considerations. Because older children conserve

quantity and younger children do not, Piaget has inferred, from these investigations, support for the hypothesis that conservation characterizes a more advanced level of cognitive development.

Mehler and Bever (1967) criticized many well known studies of conservation of quantity for their failure to include children under 4 years. Cognitive theorists using this cut-off point had been forced, in effect they said, to extrapolate downward about a supposedly invariant developmental sequence.

Below this cut-off, Mehler and Bever, using a two row-array judgment problem with clay pellets, discovered a curvilinear conservation curve for children between the ages 2-4 and 4-7, when they plotted age against the probability of children making conservation responses. The fewest conservation responses were made by children aged 3-8 to 4-3. They concluded that the youngest children showed conservation, fewer of those at an intermediate age apparently had it, and the older children had regained it. They interpreted these findings about the children in the middle of this age range in terms of their being overdependent on perceptual strategies.

It may be observed of Mehler and Bever's (1967) methods that, in contrast to the typical conservation experiment, they presented tasks which rely more heavily upon the child's receptive language and less upon expressive language. For example, they did not ask the child to explain his responses; if he indicated that one row had more pellets, that response was scored directly as conserving or non-conserving. Further, in another condition they used unequal rows of M & M candies and invited only the child's non-verbal response of taking and eating the preferred row. Selection of the more numerous row was scored as a conservation response. Their greater reliance on receptive language skills appears to be an important task modification--a change that places

younger children in a somewhat better position to demonstrate what they know.

Properly speaking, however, and contrary to Mehler and Bever's (1967) usage, one does not say that preconceptual children conserve (Piaget, 1968). Even though they make a non-verbal form of "conservation" response in a given choice task, it may be pseudo-conservation; conservation by Piaget's (1952a) definition requires verbal explanation. Piaget would contend that the pre-conceptual child only appears to conserve in response to particular stimulus conditions, but under other conditions will not do so. Thus he does not conserve, since to conserve implies coordinated activity of multiple nesting with reversibility, independent of isolated stimulus conditions. The present study retains Piaget's definition of conservation. It also recognizes the findings of Mehler and Bever (1967) as provocative and potentially informative. To avoid confusing their more non-verbal procedures with those of Piaget, the term "conservation" response is introduced as appropriately delimiting of the phenomena studied by Mehler and Bever (1967). That is, additional evidence is required, beyond a child's "conservation" response, before one can infer conservation proper. This distinction parallels Goldschmid and Bentler's (1969) separate tabulations of "behavioral" and "explanation" scores.

Since Mehler and Bever's work, several investigators have paid increased attention to the role of language in conservation tasks (Flavell, 1971; Hamel & Witt, 1971; Saltz & Medow, 1971; Dimitrovsky & Almy, 1972). Other studies have specifically highlighted children's understanding of relational terms like more and less in questions (Pratoomraj & Johnson, 1966; Griffiths, Shantz & Sigel, 1967; Donaldson & Balfour, 1968; Harasym, Boersma & Maguire, 1971; LaPointe & O'Donnell, 1974). As yet, none of these lines of work has clarified

adequately the specific contributions of language factors in the Mehler and Bever (1967) study.

To determine the information still needed to interpret Mehler and Bever's (1967) findings, it is helpful to distinguish two novel aspects of these: a) "conservation" responses by very young children (i.e., below four years of age) and b) the "decline" in "conservation" responses around four years.

Regarding the first novel aspect, there have been several purported replication attempts. The first of these (Beilin, 1968) failed to replicate the findings but perhaps because the methods were too different (Bever, Mehler & Epstein, 1968). Rothenberg and Courtney's (1968) study produced different results from Mehler and Bever (1967). A possible explanation is that the later study's sample contained over one-half lower class background children compared to a probably all middle class sample in Mehler and Bever's (1967, footnote 2) study. Social class differences have been shown to affect the age at which conservation appears (Wasik & Wasik, 1971). Beyond this difference, the study appeared to be an adequate attempt at replication. Calhoun (1971) may have replicated the findings for the youngest children (2-4 to 2-7), but because of their clearly unstable behavior (cf. Piaget, 1968) they were omitted from the statistical analysis. LaPointe and O'Donnell (1974), who varied some from Mehler and Bever's (1967) procedures, found no evidence of conservation in the youngest children.

The above failures to replicate for the youngest children suggest that subsequent efforts to understand the Mehler and Bever (1967) findings might better focus on the second aspect of their work: the apparent "decline" around four years in "conservation" responses. None of the preceding studies had clarified this finding, although Calhoun (1971) had made the important

observation that Mehler and Bever (1967) had confounded in their design mode of responding (naming or eating) and materials used (clay pellets or M & Ms). Calhoun's (1971) study unconfounded these by using only M & Ms to obtain both naming and eating responses from each child (with order effect balanced). Calhoun's (1971) results, however, did not correspond to Mehler and Bever's (1967).

The present study is an attempt to replicate only the second aspect of Mehler and Bever's (1967) findings, i.e., the temporary decline of "conservation" responses. This requires examination of an age group clustered at about four years plus a younger and an older group, and omits examination of the youngest children, whose responses are unstable (Piaget, 1968; Calhoun, 1971). The study accepts as valid and follows Calhoun's (1971) procedure for the unconfounding of effects. In following Calhoun, however, major interpretive attention is given to the language of the examiner's question or remark to the child (i.e., "Which is more?" or "Take the one you would like to eat.") as a critical variable, rather than to the child's mode of responding (i.e., naming or eating). This emphasis is occasioned by the growing literature already mentioned on children's understanding of relational terms such as more. Further, the present investigation views the order of presentation of problem types (more or eat) as an important treatment effect which can potentially clarify Mehler and Bever's (1967) finding of a U-shaped "conservation" response function in relation to child's age. The distinction is maintained between the terms conservation and "conservation" responses. This is a study of the latter only.

Specifically, the question, "Which row is (has) more?", may be viewed as inviting the child to give a cognitive response to the meaning of more. That is, whereas the stimulus materials might be judged to be more in as many

different ways as the child currently understands more, (which is equivalent to the number of dimensions, attributes or qualities that he has learned to order or associate with more), for him to make the expected response (i.e., in terms of the concept of number) requires that he perceive the question of more, when framed in this particular colloquial manner, to beg for this and only this meaning of more. Thus, a young child might hypothetically understand more in the contexts of number, density, and length, but appear not to understand more as number if he were provided insufficient context to clarify which meaning of more was being requested.

In contrast, the instruction, "Take the row that you would like to eat and eat the whole row" invites the child to express a preference based on his internal standards of relative desirability. If the materials thus presented to him are desirable (which many young children find M & Ms to be) and the child has a concept of more meaning "more numerous", he might be expected to apply it under these conditions by selecting the more numerous row. If this were the case, young children should correctly select the more numerous row when told to eat than when asked to ponder which is more. In Mehler and Bever's (1967) study the five age groups from 3-0 through 4-7 all selected the more numerous rows in greater proportions under the eat conditions than in response to the more question. This is not true for children under 3-0, but their responses have been observed to be quite unstable (Piaget, 1968; Calhoun, 1971). Mehler and Bever's (1967) study, however, does not provide an unequivocal test of this interpretation because of their confounding of materials with response mode. Calhoun's (1971) findings with the foregoing variables unconfounded, do not support this interpretation. It is generally supported by Rothenberg and Courtney's (1968) results; but their study like Mehler and Bever's (1967) confounded materials and modes of response. Mehler and Bever interpreted this

effect of M & Ms in terms of candy providing an incentive that enables the child to overcome his dependence of his perceptual strategy (e.g., attention to length or density). The implications of this motivational or incentive interpretation have not been pursued systematically (cf. Calhoun, 1971, for more discussion of this). This interpretation is examined further in this study. See Kahn and Garrison (1973) on this point with an older sample.

It may be that the confounding of the above variables magnifies the difference between the eat and more conditions. That is, with the variables confounded, eat occurs in association with materials that are desirable to the child (M & Ms) and more occurs with personally meaningless materials (clay pellets). The strategy used in the present study to sort out these factors is to determine whether the more question will elicit more "conservation" responses when the child has first had the eat instruction than in the reverse order. This is done with the earlier confounded variables unconfounded, following Calhoun (1971).

The present conception, however, predicts that the task order effect on the more question will operate in this way only for an in-between age group (3-8 to 4-3) which Mehler and Bever (1967) found to decline in "conservation" responses. Actually Mehler and Bever (1967) discussed the decline in terms of the first age group in which they detected a drop (3-8 to 3-11), but if their eat and more distributions are combined to offset confounding, it is clear that age 4-0 to 4-3 is also low. These may be combined to form a new group 3-8 to 4-3. To test this for such a precise age grouping requires of course use of a child sample quite similar to theirs in social class as well (Wasik & Wasik, 1971).

An assumption of the present study is that the observed decline is a real one which occurs in conjunction with a change in the child's concept of more. During this transitional time the child has not lost his earlier understanding of more but his increasingly complex concept may confuse him about which answer is wanted. It might be expected that in using the task order eat-more, the prior occurrence of eat would cue the child as to the meaning of more being requested (i.e., the old familiar more of consummatory behavior). He has learned for example to say "I want more _____." With increasing age, the child would gain facility in understanding the colloquial question form that anticipates a response in terms of number comparison. For the child who is transitional in his conceptual grasp of more, in the absence of special external cues or structure he might be expected to respond on the basis of other available strategies, much as a younger child would. Piaget (1968) has suggested that a transition in the child's concept of more may in fact occur shortly after age 3-6, at which time perceptions of length may become influential. Before he attends to length, the younger child may judge on the basis of crowding or density (Piaget, 1968). Piaget (1968) also notes that under age 3-6 the understanding of more is in an additive sense, with the comparative sense appearing later. After age 3-0 and by near age 4-0 a majority of middle-class children seem to comprehend the logical relation of same to more in questions (LaPointe & O'Donnell, 1974), again suggesting a transition perhaps during the second half of this year. In lieu of normative data on the transition, the age range within which Mehler and Bever (1967) found "conservation" responses to decline might be used to represent this transition. A final, related purpose of the study is to determine whether, over this age span, the child progresses in the comprehension of more.

Method

Sample. Fifty children, 21 boys and 29 girls, attending a university-

maintained cooperative nursery school in Bloomington, Indiana, were selected for the sample. They were children of university students and can be characterized as of middle social class origins and of above average ability. The sample was selected to span on either side the age range within which Mehler and Bever (1967) had found a U-shaped curve for frequency of "conservation" responses, i.e., 12 children aged 3-0 to 3-7, 28 aged 3-8 to 4-3, and 10 aged 4-4 to 4-7. The middle group was made larger to permit an analysis of an hypothesized order effect.

Procedure. Each child was individually pretrained to understand the notion of row and of sameness by confronting him with two identical, parallel, straight rows of four brown M & M candies and by inquiring whether he perceived the rows to be the same. All M & Ms used in the study were of identical color to preclude any child responding on the basis of color preference alone. Materials matched portions of those used by Mehler and Bever (1967) and Calhoun (1971). All children who consistently evidenced by pointing an understanding of row and the equivalence of rows (i.e., that they are the same) during pretraining were administered the main task; none were excluded on either ground. The examiners were unaware of the children's ages.

Each child was randomly assigned to one of two order effects and was teste by a male examiner on a conservation problem immediately following the pretraining. Before each problem presentation the child was required to respond with same to the two identical rows of M & Ms. Then the problem presented the child was one straight row of M & Ms evenly spaced over 178mm, with a parallel row of six M & Ms evenly spaced over 76mm, 51mm farther away from him. This was a transformation task (child viewing) in which objects were added and respaced in the farther row in a single operation. Some studies have shown a

position effect for rows nearer and farther from the child. Piaget (1968) observes that the row nearer the child is the one likely to be judged as more numerous. Thus any bias resulting from the fixed position effect would appear to have operated against the conclusion that these young children were making "conservation" responses.

In the first order effect (called the MORE condition) the child was first asked "Which row is (has) more or are they both the same?" After a brief pause during which the materials were removed, they were restored to the prior equivalence arrangement, the child was questioned and finally the M & Ms were placed again into an arrangement of unequal rows in the child's viewing. The child was told "Take the row you want to eat, and eat all the M & Ms in that row." This essentially replicated Mehler and Bever's (1967) procedure except for the exclusive use of M & Ms (Calhoun, 1971). In the second order effect (called the EAT condition) the same two instructions were given in the reverse order. It should be noted of this second order that the word more was never encountered by the child in the experiment prior to its second position presentation (i.e., after eat and within the traditional conservation question).

The responses of the children were written down by the experimenter and sessions were tape recorded. All responses to the question more which correctly identified the more numerous row (i.e., of 6 M & Ms) were scored as pass; all responses of same and those which selected the less numerous row were scored as fail. Scoring of child actions after the eat instruction followed Mehler and Bever (1967). That is, again selection of the less numerous row was scored as fail and, conversely, pass for the more numerous row. Note that replication of the Mehler and Bever (1967) paradigm precludes a direct check for same responses to the eat instruction. Indirectly, however, it may

be observed in passing that no child failed to make a response and that long choice-making delays were seldom encountered.

Results

Q1. The first question examined was whether the intermediate age group (3-8 to 4-3) gives more "conservation" responses to the more question under the second order effect (EAT condition) than under the first order effect (MORE condition). The necessary tabulations for determining this appear in Table 1.

Insert Table 1 about here

Children of this group made more "conservation" responses to the more question when it followed the eat direction than under the reverse order ($\chi^2=4.36$, df=1, $p< .05$). Their incorrect responses were usually selections of the longer, less numerous row rather than judgments of same. Prior investigations have suggested a shift from attention to density to attention to length as a perceptual strategy (Piaget, 1968). Some of the intermediate age group appear to have adopted a strategy of attending to length. But following the eat direction some were able to overcome the tendency to attend more to length and may have interpreted more in the sense of more numerous. As can be seen by inspection, "conservation" responses occurred with about the same frequency in the youngest (3-0 to 3-7) and oldest (4-4 to 4-7) groups, with regard to order of presentation.

Q2. The second experimental question was whether the child's understanding of more is a function of age. This question was tested without regard to the order effect by combining across orders. The trend appears linear and is toward an increasing comprehension of more in older age groups, as illustrated in Figure 1a.

Insert Figure 1 about here

Simple frequency analysis was used again to determine whether this was a reliable finding. It was (χ^2=7.62, df=2, p< .05).

Q3. A third question that was formally tested was whether responses to the eat direction were a function of age, or more specifically, do children in the middle group give fewer "conservation" responses. A curvilinear trend was observed in Figure 1b. This was a reliable difference across the three age groups (χ^2=11.2, df=2, p< .05) for pass/fail, with the two orders combined. This U-shaped trend replicates the Mehler and Bever (1967) finding.

Q4. A final question asked was whether the eat instruction or the more question elicits more "conservation" responses. This was approached by combining the raw tabulations of Table 1 across age levels separately within each order effect for more and eat. These cannot be compared directly within their own order effects by chi-square because the observations are dependent. Comparisons can be made, however, between more responses of one order with eat responses of the other order, because the samples for the two orders are independent. Making the comparisons two times (once for each possible cross-sample comparison) produces two independent answers to the question (i.e., an answer and a replication). The overall magnitude of the difference between eat and more is illustrated indirectly (i.e., for samples combined) by a comparison of Figure 1a to 1b. This is a reliable difference favoring eat over more (χ^2=6.87 & 8.11, df=1, p< .05).

Discussion

Q1. The findings clearly supported the hypothesized order effect within the intermediate age group (3-8 to 4-3). It had been reasoned that the prior presentation of eat would cue the child regarding the possible meaning of more, i.e., that the cue would elicit some quantitative intuition based on the child's

prior experience of eating. This perspective differs from Mehler and Bever's (1967) emphasis on incentive value. In this connection Bermudez, Prather, Berry, and Tebbs (1974) have found that a significant number of older children (M=5.5 years), who do not conserve volume, appeared to do so when their attention was drawn to the desirability of the liquid to drink. Kahn and Garrison (1973) had hypothesized and confirmed an order effect for conservation of number among primary level children (K-2nd grade) as a function of whether paper clips or candies were used first.[4] In the order candy/paper clips, candy facilitated conservation of paper clips; and paper clips first depressed conservation of candies. Thus the finding of such an effect appears not to be limited to the pre-operational child. These studies as yet provide no definitive answer to the incentive versus cueing interpretation.

When intermediate-age children in the present study made non-"conservation" responses to more, these were usually selections of the longer, less numerous row rather than judgments of same (see Table 1). This might support the hypothesis that they used a perceptual strategy of attending to length (cf. Mehler & Bever, 1967). Following the eat direction they then may have been able to overcome this strategy and to interpret more in terms of numerosity. It will be recalled from the tabled results that this order effect was not observed in either the youngest or oldest group. The restriction of the differential phenomenon to this transitional-age group provides some credibility to the study's psycholinguistic rationale--that the temporary decline (Mehler & Bever, 1967) results from a development in the child's understanding of more.

Q2. The age-related increase in "conservation" responses easily can be overinterpreted as confirming a progression toward operational conservation; it should not be. The distribution (Figure 1a) does not display the properties

of such a transition, i.e., if this were its meaning the rise should be more sudden and at a later age. To make an interpretation about conservation would further be a mistake from the perspective of how the data were collected: no test was made of the children's reasons for their selections. This study deals only with "conservation" responses.

Instead, the age trend may be interpreted as verbal concept acquisition. That is, some children increase between 3-0 and 4-7 in the recognition of those semantic contexts in which more refers to numerosity. They seem already by age 3-0 to have a grasp of numerosity to which more becomes increasingly applicable over this age span. The evidence for the early grasp of numerosity can be seen from the responses to eat in this study as well as from Mehler and Bever's (1967) work. The order effect of eat/more at an intermediate age (in Q1) is consistent with this interpretation of the age trend for more.

It may be that an intuitive concept (pre-concept) of numerosity exists quite early. Piaget's (1969) discussion of perception might allow of this possibility in terms of "constancy." Constancies depend on sensory-motor schemes (Piaget & Inhelder, 1969). The early operations of consummatory behavior, in the context of which parents have introduced quantitative terminology, could serve as the basis for a pre-concept of number. Several studies in other experimental areas suggest the existence of forms of quantity recognition in pre-operational children (Klahr & Wallace, 1973; McDowell, 1962; Potter & Levy, 1968. Cf. Kaufman, Lord, Reese, & Volkmann, 1949). Further, numerosity discrimination has been conditioned in pre-operational children (Ginsberg, 1969); equality and inequality of number have likewise been conditioned (Bucher & Schneider, 1973). Whether a) recognizing or discriminating numerosity and b) the development of number conservation are parts of a unitary process goes

beyond the present study's data. Piaget's (1969; Piaget & Inhelder, 1969) strong distinction between perception and conceptual thought inclines him to view these processes as separate. In any event, it is difficult for the present investigators to view these early number-related skills as somehow less important to the practitioner who is concerned with the child's development.

Q3. As was noted before, the U-shaped curve of Mehler and Bever (1967) was replicated. Their earlier conclusion about this might, on the basis of the present findings and conceptions, be reformulated as: young children make intuitive "conservation" responses before three and one-half years, then they appear to lose them as their concept of more increases in complexity around age four, and then they appear to recover them at about four and one-half years. The decline at around four years, however, is only apparent. It is an artifact of verbal concept development. Moreover, it is not a decline in conservation, which has not yet appeared. When Mehler & Bever's (1967) original methodology was unconfounded, following Calhoun (1971) in the present study, the decline occurred only for the eat instruction and not for the more question. Presumably the decline in Mehler & Bever's (1967) study for the more question was a result of their particular confounded methodology. The apparent conceptual age-regression on a conservation task seems not to be limited to number (Dasen & Christie, 1971) and is worthy of systematic investigation using the kind of psycholinguistic approach pursued here, in addition to the usual analysis in terms of decalages.

Q4. Overall eat elicited far more "conservation" responses than more, when all ages were considered simultaneously. Across the three ages studied, the composite difference between eat and more is perhaps best understood as resulting from the relatively advanced state of the children's ability to discriminate numerosity in relation to their understanding of the semantic contexts in which

more applies in a comparative sense.

An in-depth analysis of the youngest group's behavior corroborates the above interpretation, while revealing additional behaviors that were somewhat unique to them as a group. As has been mentioned, the youngest children seemed to have an intuitive grasp of numerosity when told to eat. The more numerous row in the array that they were shown was more dense and had M & Ms added to it, both of which factors favored this youngest group's selection of it for the reasons previously discussed (Piaget, 1968). Yet despite the favored status of this more dense row, it produced the expected outcome only for eat and not for more. Regarding the large discrepancy between eat and more for this youngest group it may be observed that 70 percent of their failures to the more question were not due to selections of an incorrect row but due to responses of same (Table 1, numbers in parentheses). This demonstrates a positive bias against using the response more. This most probably resulted from the emphasis during the pretraining on having the children use the response same to denote equivalent rows. Not fully understanding more or same, many of this youngest group said what they thought the examiner wanted--an experimental risk on which others have remarked regarding very young children (Flavell, 1971; Rose, 1973). This problem might be counteracted in the future by conducting any necessary pretraining so as to minimize direct carryover into the actual experiment. The fact that the child's probability of using same and more could so readily be influenced shows that these terms remain verbalisms in some contexts for this youngest age group. The tendency was for the intermediate group (10 percent) and oldest group (zero percent) not to make incorrect guesses of same. This discussion has been limited to errors of same for the more question; it will be recalled that same was not a

possible response to the eat direction.

Implications

Most of the direct implications for further related research have already been touched upon in the discussion. It is, nevertheless, evident that much remains to be learned of pre-conceptual number-related skills before the early childhood practitioner can feel assured that all important questions have been explored. Conservation is not the whole story of early number development, and to over-centrate on it can lead to the neglect of other important questions whose answers could affect curriculum or treatment planning. What should be the recommended research paradigms for these new studies is not yet evident. It is clear that to fathom the development of the pre-conceptual child will require greater attention to the child's language comprehension and to the use of non-verbal methods of inquiry. These unfamiliar areas cannot be travelled by relying upon the familiar clinical method of conservation inquiry. These studies will require thought and effort to controlling for the many factors which may influence the child's performance (e.g., density, length, position, order effects).

In working with the pre-conceptual child, there appear to be three aspects of early conceptual development and learning which must continue to concern the practitioner. The importance of each of these has received at least some attention in the preceding presentation. In the cognitive area, the practitioner must consider where the child is in terms of: a) operative conceptual development and curiosity, b) language and perception, and c) the role of confirmation or consistent feedback. A broad, child-experimental approach which follows Piaget's leads will prove invaluable for the first of these. The second aspect can add many dimensions to the first. Practitioner attention to the child's verbal concept development and perception of the world can increase the child's chances

for realizing and using his pre-operational potentials. Once a commitment is made to deal with the child's verbal concept development and perceptual development, in addition to those developments which lead to operative intelligence, the practitioner will do well to consider the third aspect. Some things are learned quite efficiently by exploration and discovery, but at times the young child requires guidance, feedback, confirmation, and direction in his learning. Reinforcement has a legitimate place in work with young children, although its risks must as readily be acknowledged.

The skilled practitioner learns to attend to all three of these aspects of the developing young child and to respond in a balanced manner to them, appreciating all the while the nuances of the child's individuality and of the complex relationships between learner and the physical and social environments.

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Footnotes

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[4]This study was not known to us at the time of our investigation, although it parallels our work in important ways.

Table 1

Frequency of Response by Group, Procedure, and Task

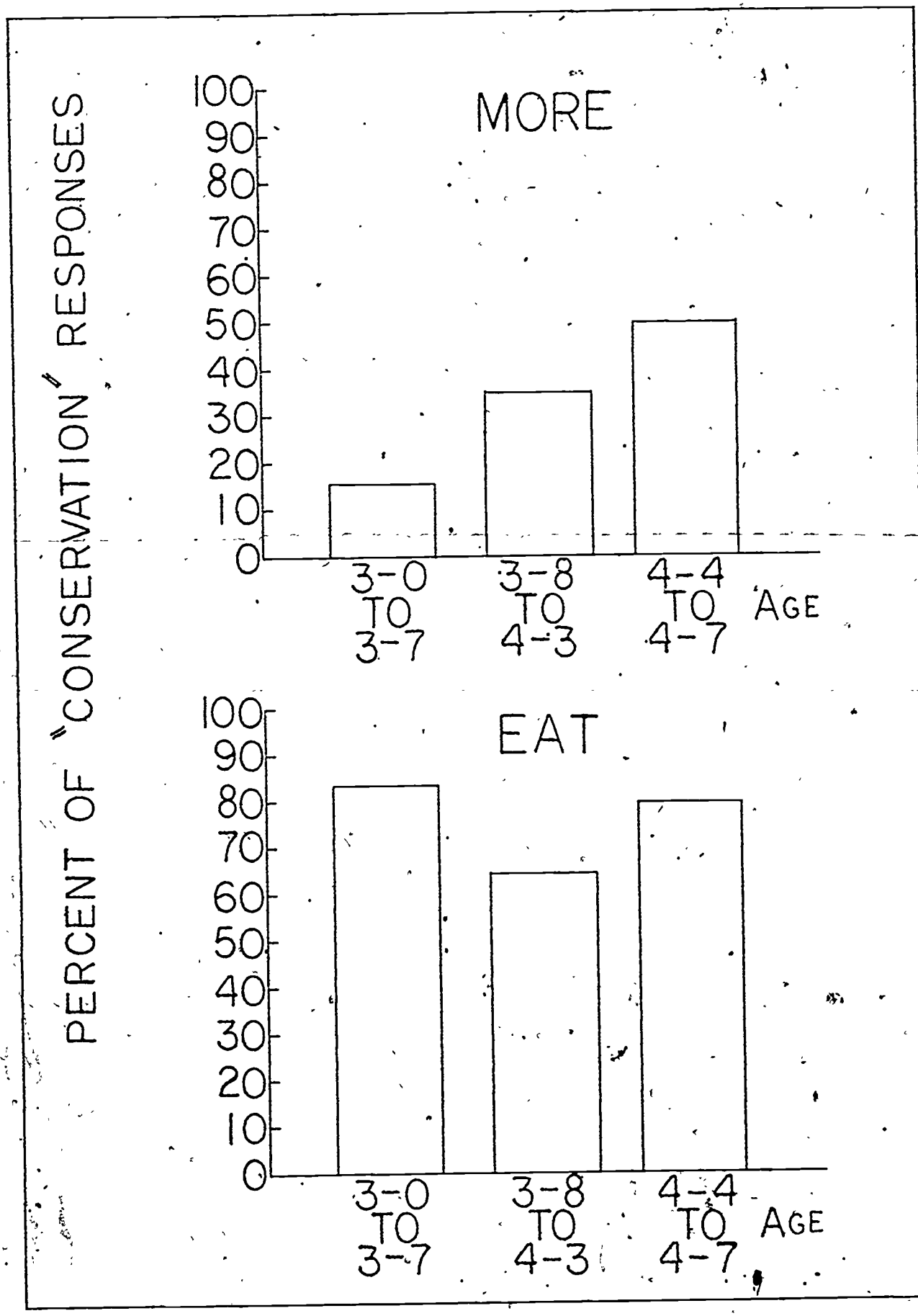
Procedure	Task	AGE GROUP 3-0 to 3-7 Pass	3-0 to 3-7 Fail*	3-8 to 4-3 Pass	3-8 to 4-3 Fail*	4-4 to 4-7 Pass	4-4 to 4-7 Fail*
1	More (1st)	1	5 (3)	2	11 (2)	3	3 (0)
	Eat (2nd)	6	0 (0)	9	4 (0)	5	1 (0)
2	More (2nd)	1	5 (4)	8	7 (0)	2	2 (0)
	Eat (1st)	4	2 (0)	9	6 (0)	3	1 (0)

*Fail includes all "same" responses. The number of fails that are "same" responses is shown in parentheses for each.

Figure Captions

Figure 1a. Responses to more question, order effects combined.

Figure 1b. Responses to eat instruction, order effects combined.


PERCENT OF "CONSERVATION" RESPONSES
MORE
100
90
80
70
60
50
40
30
20
10
0
3-0 TO 3-7
3-8 TO 4-3
4-4 TO 4-7
AGE
EAT
100
90
80
70
60
50
40
30
20
10
0
3-0 TO 3-7
3-8 TO 4-3
4-4 TO 4-7
AGE